

February 19, 2009


To: Joern Larsen
From: Waste Management Group
Subject: Bench-top Neutralization Procedure

We have reviewed the following Bench-top Neutralization Procedure submitted by you:

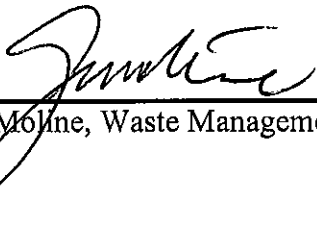
**Acid Waste Benchtop Neutralization for Radioactive Mixed Waste
From Elemental Analysis with ICP-MS**

**Created: September 7-2007
Final Revision November 6, 2008
Author: Joern T. Larsen**

We approve of this procedure as written for the wastes described in the procedure. This procedure is approved only for these wastes. If the waste generating processes or composition of the wastes changes significantly, please contact your Generator Assistance Specialist, Howard Hansen, to review the changes.



Charlotte van Warmerdam, Waste Management Compliance Team Leader



Gale Moline, Waste Management Certification Team Leader

Acid Waste Benchtop Neutralization for Radioactive Mixed Waste From Elemental Analysis with ICP-MS

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1. Introduction

This procedure is for treating radioactive/mixed acidic waste containing one or more of the radioactive isotopes as allowed under the current LAS L019 (e.g. uranium, thorium, technetium, strontium 90, tritium, potassium 40). The amount of acid in solution (HNO₃) will be below 5% by volume, for HF below 0.1% by volume.

This procedure is an integral part of training, and is not intended to take place of required EH&S training.

The mixed waste might contain one or more of the following constituents, with concentrations less than shown in the table below (where the concentrations are the maximum concentration allowed according to Universal Treatment Standards (UTS) for Underlying Hazardous Constituents (UHC)):

As	<	1.4	mg/L
Ag	<	0.43	mg/L
Ba	<	1.2	mg/L
Be	<	0.82	mg/L
Cd	<	0.69	mg/L
Cr	<	2.77	mg/L
Hg	<	0.15	mg/L
Ni	<	3.98	mg/L
Pb	<	0.69	mg/L
Sb	<	1.9	mg/L
Se	<	0.43	mg/L
Tl	<	1.4	mg/L

An in-lab semi-quantitative ICP-MS analysis will be performed to make sure the waste satisfies the above limits. This documentation will be kept with the treatment log and not submitted for waste requisition, **unless** the waste contains UHC's above the limits – see section 2.1.i below.

The waste will not contain cyanide, or any organic solvents.

2. Preparation for treatment

2.1 Documentation

i) An accumulation log is necessary for all waste to be treated in order to document that the hazardous waste treated is from one experiment, or a set of experimental processes, and is of similar composition with no mixing of incompatible wastes (or underlying hazardous constituents – UHCs) such that treated waste residue can be classified as non-hazardous, radioactive waste. See section 1) above for the maximum concentrations allowed for UHCs.

Treated waste residue that still contains sufficient concentrations of chemicals to render it hazardous, or is hazardous because it initially during generation was mixed with or derived from specified chemicals or chemical mixtures that are hazardous (according to Federal and state regulations), is still considered hazardous waste.

Waste must contain no organics and no cyanide.

ii) An analysis of the liquid waste will be done to establish the actual activity of any radioactive isotope for each batch/container to be treated. If the activity of the specified batch is below the MDA (Minimum Detectable Activity) for the isotope, then a Rad Waste Tag must be filled out with the MDA used as the activity. No materials with known added radioactive material containing alpha emitters can be considered non-rad.

The result of this analysis must be recorded on a bench top treatment log sheet.

2.2 Containment

A 5000 mL wide mouth HDPE container is used for the collection and containment of acidic radioactive effluent as well as for neutralization. The container should not be filled over the 4000 mL mark, leaving 3.5 in between fluid level and bottle top for containment of possible foam. No carboys with spigots allowed.

The 5000 mL container is placed in a 2-gallon plastic bucket for spill protection. This bucket is marked as a MW-SAA.

3. Safety

3.1 Safety Equipment

- * Lab coat
- * Gloves
- * Face splash shield

3.2 Other

Treat maximum 4000 mL at a time, as to avoid accidents/problems if the reaction upon adding sodium bicarbonate is vigorous.

4. Treatment of Liquid Waste

4.1 Equipment

- * Stir bar
- * pH meter or pH indicating solution
- * stir plate
- * spoon for measuring out sodium bicarbonate
- * sodium bicarbonate (powder)
- * plastic beaker or bottle for sodium bicarbonate
- * 2-gallon plastic bucket for containment

4.2 Neutralization

Weigh beaker or bottle with sodium bicarbonate, record mass. Place 5000 mL waste container with the acidic radioactive effluent in 2-gallon bucket on stir plate in fume hood. While stirring, add maximum 5 cc of sodium bicarbonate initially, then maximum 5 cc at a time. Wait until foaming stops before adding more sodium bicarbonate. Continue adding sodium bicarbonate until there is no reaction and pH is ~7 or indicating solution has color indicating pH 7. Record how much sodium carbonate was used.

NOTICE: In case of a spill containing radioactive effluent, EH&S Radiation Protection Group (RPG) must be contacted and asked for directions before any cleaning action will be taken! Updated information on responsible RCT and phone number to call is found in the Emergency Response Guide, Radiation Spill (review before neutralization).

When immediate urgent assistance is required (e.g. spill response) and the primary and backup radiological control technicians (RCTs) are unavailable – call x7277 as dialed from LBNL telephones. This number will call all RPG telephones during office hours and be directed to an RPG cell phone outside office hours.

4.3 Disposal

Waste must be managed as low-level radioactive waste after treatment, following all generator requirements. The radioactive waste tag must indicate the waste is a treatment residual from bench top neutralization. The waste tag must describe the waste as it exists **after** treatment, not as it was before treatment – including amount of NaCO_3 in solution.

Upon submittal for waste pickup, complete treatment information must be included.

5. Recordkeeping

A treatment log must be maintained for all bench top treatment activities. The log must record:

- i) Generation dates – beginning and end date
- ii) Treatment date
- iii) The amount of waste treated
- iv) Activity of waste
- v) Radioactive Material Tag number for each container neutralized, and the Rad Tag number for accumulated volume after treatment
- vi) The initial or signature of the person who performed the treatment.
A list of authorized treaters will contain name, initials and signatures of all authorized personnel.
- vii) Date of disposal (i.e. when requisition for pick up was faxed to HWHF)

A copy of a treatment log is attached.

6. Time limitation

The waste must be treated within **ten days** from its generation date to be allowed under California regulations.

7. List of authorized personnel

The persons authorized to perform the treatment will be listed, and evidence that appropriate procedural training has been completed by each of these persons will be maintained in a training log showing on-the-job training with a brief description of the topics covered.

A copy of a training log/list of authorized personnel allowed to do the bench top neutralization is attached.

**Training Log with List of Authorized Personnel
who has received training in
Acid Waste Benchtop Neutralization for Radioactive/Mixed
Waste for LAS L-019**

The following personnel has the necessary knowledge or has received on-the-job training in acid waste benchtop neutralization, including

- 1) documentation and characterization of waste (making sure it contains no UHCs) and how to fill out the Treatment Log
- 2) safety precautions
- 3) neutralization procedure
- 4) how to fill out the Radioactive Material Tag for treated waste
- 5) how to use/fill out an accumulation log if treated waste is being accumulated in a larger than 1 L bottle.

[illegible]

